

Manatees in the Guianas

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INTRODUCTION

THROUGHOUT the world the Sirenia are disappearing, and the two genera which remain are all that are left of a once widespread order of mammals (Allen, 1942, pp. 528-552). In recent times a third genus, *Hydrodamalis*, the large Steller's sea cow of the Bering Sea, was completely exterminated by irrational killing, probably within thirty years of its discovery in 1741 (Stejneger, 1887, p. 1054).

The dugong (*Dugong dugon*), at present found in small numbers around the tropical and sub-tropical coasts of the Indian and west Pacific Oceans, is the only remaining species of the Family Dugongidae which fossil evidence shows to have been formerly almost world-wide in its distribution. Manatees (*Trichechus* spp.) now live in tropical and sub-tropical rivers and coastal waters on both sides of the Atlantic. They belong to the Family Trichechidae for which so far there is no fossil history. Simpson (1932, p. 498) suggests that the manatee may possibly have started as a fluvial form in West Africa and then spread to America, thus replacing the earlier dugongs in the Atlantic.

There are now three species of manatees, *T. senegalensis* in West Africa, *T. manatus* in the Caribbean and Gulf of Mexico, and the smaller *T. inunguis* in the Amazon and Orinoco Rivers. *T. manatus* is divided into two subspecies, *T.m. latirostris* around the Florida peninsula and *T.m. manatus* in the rest of the region, including the Guianas. There seems, however, to be some doubt about the validity of any anatomical distinction (Moore, 1951a, pp. 17-18).

The survival of both dugongs and manatees is now precarious and both are in need of proper conservation. Both are large, slow-breeding, defenseless animals with palatable flesh. Both are already much less abundant and less widely distributed than formerly. It was in an attempt to help towards their conservation that we went

to British Guiana early in 1962 to study the distribution and habits of manatees. The work was made possible by a generous grant from the New York Zoological Society, followed by others from the Nuffield Foundation, the Zoological Society of London and Cambridge University (Foreign Travel Fund). British Guiana was considered to be the best place in which to study manatees as it probably contains as large a stock of these animals as any country. Further, the presence there both of helpful people and of manatees in a state of semi-domestication made possible the best use of the three months available.

A preliminary letter and a short paper dealing primarily with the status of manatees, their present abundance and possible economic uses, have already been published (Bertram & Bertram, 1962, 1963). The present paper deals mainly with more detailed observations on the habitats and habits of manatees in the Guianas.

DISTRIBUTION AND ABUNDANCE WITHIN THE GUIANAS

The shore is so shallow and the water so laden with silt carried down by the Orinoco and other huge rivers that the sea in this northeastern region of South America is brown in color, turbid and almost devoid of fixed vegetation. Thus it is a most unpromising environment for manatees, which are entirely herbivorous animals, normally grazing on "sea grass" and other aquatic plants. Nevertheless, manatees are found in the sea all along the Guianan coast, but it is probable that they are traveling from one river to another, rather than living a permanently marine life. They are most often seen near the mouths of rivers or in the neighborhood of sluices ("Kokers") guarding the outflows of drainage channels from the sugar plantations. Both rivers and channels may carry floating vegetable matter into the sea. No evidence ex-

ists as to whether manatees are directly affected by the salinity of the water in which they live.

All the main rivers of British Guiana and of Surinam (formerly Dutch Guiana) probably contain manatees in the flat coastal regions. The absence of a coastal plain in Cayenne (French Guiana) results in there being few suitable habitats in that country. The passage of manatees far upstream is in many cases barred by rapids, but in some rivers, particularly in regions of wet savannah, the animals probably live along the whole length. The areas providing the best environment, the largest masses of floating grass, are the Courantyne River region on either side of the eastern boundary of British Guiana and the rivers of the extreme northwest of the country. Further west is Venezuela, which still contains considerable stocks of manatees.

Though it is comparatively easy to ascertain the distribution of manatees by traveling around the country and questioning the local people, it is far more difficult to find out about the abundance. Direct observation is virtually impossible. Not only are the rivers extremely large, the Essequibo being over 20 miles wide at the mouth, but the water is dark brown and usually opaque with mud; the manatees are invisible apart from the chance glimpse of the tip of the nose when breathing. The only figures available (and none of them are surrounded by sufficient evidence to give them any exactitude) are these: in 1959 in nets tied across the piers of the bridge across the Canje River, nine manatees were caught in two months; in 1962 during our visit five were brought into Georgetown from the Abary River and the catcher said he had eight more fenced off ready for capture¹. Probably a total of between 70 and 100 individuals have been caught for the Fisheries Service in these two rivers since April, 1959.

Apart from that information, present distribution and frequency data have to be built up from such reports as: "In some of the rivers of the northwest, you will probably see a manatee every half hour when traveling by canoe;" "There were two feeding on this corner last Saturday;" "I have never seen one;" or "Manatee meat appears in this market about once in two months." Integrating such material, we arrived at the tentative conclusion that there are now probably some thousands, but not tens of thousands, of manatees in British Guiana. It is certainly the general belief that they are much scarcer than in former times and have been scared away from many of the lower reaches of rivers by the increasing use of powered boats.

¹These were later said to have escaped.

AVAILABILITY

The availability of manatees in captivity made it possible to study their habits in some detail. Not only were there partially tamed animals in the public pools in the Botanic Gardens in Georgetown, which would in the evenings take grass from the hands of visitors, but there were also newly-caught individuals in more private and in more extensive waters. Under a valuable scheme initiated by the Fisheries Research Officer, Mr. W. H. L. Allsopp, in 1959, manatees are obtained by the Fisheries Service, kept for a while to make certain that they are healthy and then passed on to the Department of Drainage and Irrigation for use (Bertram & Bertram, 1963) in weed clearance in certain waterways. The possibility of handling these animals as they arrived, and of being able to watch their behavior at leisure, gave much useful information, unobtainable under natural conditions. Further, two of these manatees were living in the large reservoirs of the waterworks, which was the only place in British Guiana where the water was sufficiently clear for the animals to be visible when submerged.

SIZE

Early travelers² in British Guiana reported seeing manatees of immense sizes, up to 18 to 20 feet in length. Now they are believed not to exceed 11 to 12 feet with 7 to 9 feet being the commonest. According to the records of the Fisheries Service, of 33 individuals, presumably a random sample, the lengths ranged from 3 feet 5 inches to 11 feet. The weight of the smallest animals was recorded as 60 lbs. while the largest was over 1,000 lbs. Details of the measurements are shown in Table I below, but these are not sufficiently numerous or reliable to show whether there is any significant sexual disparity in size.

MOVEMENT

Manatees are most active in the evening and in the early morning. At these times they are feeding and occasionally disporting themselves vigorously in the water, almost like seals. They can swim quite fast, and when speeding it seems that they keep their noses above the surface. They usually travel totally submerged, making surprisingly little disturbance in the water. Swimming is by vertical strokes of the large tail. The power of this organ can be gauged by the size of the swirl and the violence of the thrashing when the animal is suddenly frightened or caught in nets, and by the many stories of capsized

²e.g., Henry Bolingbroke (1799-1806) and Lt. Thomas Staunton St. Clair (1806-1808). Both these have recently been republished by the "Daily Chronicle," Ltd., Georgetown.

TABLE I. LENGTHS OF MANATEES MEASURED BY FISHERIES SERVICE, BRITISH GUIANA.

Length	Under 6 ft.	6-7 ft.	7-8 ft.	8-9 ft.	9-10 ft.	10-11 ft.	No. measured
Females	1	5	4	5	2	3	20
Males	1	—	5	5	2	—	13
	2	5	9	10	4	3	33

DETAIL MEASUREMENTS OF THREE MANATEES.

Measurement	Male	Female	Female
Length	7' 0"	7' 2"	7' 8"
Girth	4' 10"	5' 1"	5' 4"
Length of tail	1' 7"	1' 11"	2' 0"
Width of tail	1' 7"	1' 8"	1' 9"
Length of flipper	11"	11"	1' 2"
Length, nose to flipper	1' 3"	1' 5"	1' 3"

canoes and broken backs when fishermen have come in contact. The flippers also help in swimming, particularly when the animal is moving gently about while feeding. They probably enable it to turn in its own length and to swim backwards without altering the symmetry of the body. The flippers help also in pushing the body up out of the water as far as the shoulders, with the result that the animal can graze on plants growing about a foot or more up river banks. Manatees are generally believed to be unable to leave the water, but there is some evidence that they can climb out onto dry land and can cross a low bank from one piece of water to another³. Certainly they are just able to wriggle back into the water if laid on a suitable bank nearby.

During the middle of the day manatees seem normally to be quiescent and often lie at the surface apparently basking in the sun. They may lie horizontally with the head visible, but more often the back is strongly arched and the head below water. If disturbed they are able to submerge, without noticeable movement and without a ripple or bubble of air appearing. Usually on these occasions the nose breaks the surface and a breath is taken shortly after the animal has disappeared. Occasionally manatees roll over on their backs when resting, but this may only be when they are sick. They seem to be gregarious by nature, for whenever several are kept together in enclosed waters, they tend to feed and to rest together. Furthermore they

often breathe all at the same time, several noses appearing almost simultaneously and then disappearing again. Older evidence indicates a degree of gregariousness in the wild, and even recent stories refer to "schools" or groups being seen in several places. In Florida the other subspecies is reported by Moore (1956, pp. 1-10) to live in aggregations.

Movements, of the nature of migrations, may occur but present evidence is quite insufficient for assertion or denial.

IDENTIFICATION OF INDIVIDUALS

The desirability of identifying individuals in any biological study needs no argument. Though some manatees in British Guiana could be recognized by such features as the loss of an eye, or extensive algal growth on the skin, these peculiarities could, because of the opacity of the water, only be seen when the animals were lying at the surface with part of their bodies exposed. Attempts were therefore made to mark individuals, especially the tips of the noses, so that they could be more easily recognizable. Aluminum paint and some special red and yellow dyes⁴, which had successfully been used on elephant seals in the South Orkney Islands, were tried. Unfortunately the skin of manatees seems to be continually sloughing off so that the dye is rapidly removed. Animals painted in this way were indistinguishable after two days except perhaps by examination so close as to be impractical.

Neither branding nor tagging were tried, the

³The former Curator of the Botanic Gardens, the late Mr. G. E. Wolstenholme, said he once put a manatee in a channel separated from another channel by 2 feet of dry ground and that during the night it crossed from one piece of water to the other.

⁴Four dyes were kindly supplied gratis by Imperial Chemical Industries, Ltd. They were Auramine O, Rhodamine B, Methasol Fast Yellow R and Methasol Fast Red B.

dangers of fungal infection being high in these waters⁵.

BREATHING

Normally manatees keep their nostrils closed, whether they are above or below the surface, and only open them when a breath is taken. When basking or feeding, the only occasions when it is possible to be certain that the same animal is being watched, the nostrils seem to open at intervals of about one to two minutes; eight recordings giving figures from 55 seconds to 2½ minutes. Certainly they can hold their breath for very much longer periods than this and Parker (1922, p. 133) has shown that for the other subspecies a figure of 16 minutes, 20 seconds has been recorded. Scholander & Irving (1941, p. 183) found that manatees submerge with their lungs full of air.

Both exhalation and inhalation are normally quite silent. The nostrils are usually open for under two seconds so that the volume exchange must be small. Only on one occasion, when an animal was startled, was there a sound of a breath being taken⁶. This, apart from the splashing, was the only noise they were heard to make in British Guiana, although one traveler in British Honduras⁷ said that he heard a manatee give "a deep, hoarse bellow, not unlike a fog-horn."

The capability of manatees for vertical motion without horizontal movement presumably depends upon muscular compression or relaxation of the lungs with consequent change of density, for such movement can take place without expiration or inspiration.

FEEDING

Manatees are voracious herbivores and consume large quantities of soft vegetable matter. They seem catholic in their tastes and will eat a great variety of species whether they be in the sea, in freshwater or on the river bank, and whether they be rooted on the bottom or floating on the surface. Texture seems more important than type of plant, which may range from fine grasses to leaves of "mocha-mocha" (*Montrichardia arborescens*), and they will take any plant that is sufficiently soft to be torn off

by the muscular upper lips. These lips, strengthened by lateral horny pads and armed with hairs, bristles and fibrous papillae, grasp and tear the vegetation with a movement reminiscent of the mandibles and proboscis in some polychaete worms. The food is then passed back to the grinding molars which are the only teeth present in the adult. These teeth, as in the elephant, move continuously forward during life, the individual tooth starting at the back of the jaw and eventually falling out at the front.

Sometimes the flippers are used to sweep the food towards the mouth, but at others the animals seem to rest on their finger tips and grope among the weeds with their snouts.

AWARENESS

A large herbivore perhaps does not need very keen senses for survival where food is abundant. The eyes are small, but directed upwards. It would seem that this position might be effective for an animal feeding on the surface of the water, but would preclude any binocular vision. Sight is probably not a well-developed sense and no difference in behavior was noticed in an individual which had lost its right eye.

Hearing, on the other hand, seems to be remarkably acute, despite the absence of external ear and the very small size of the auditory passage⁸. It is common practice locally to whistle to attract the attention of manatees living in semi-domestication and they appear to respond equally well when submerged or when the head is above water.

Careful observation of newly-caught manatees suggests that hearing is more important than sight in the detection of the presence of man, the chief enemy. On thirteen occasions it was possible to approach basking manatees to distances between 4 and 12 feet and they would take no notice even if their eyes were visible and open. If a hat was then waved in front of them, as on four occasions, there was still no reaction. However, on all these occasions the animals submerged immediately if the observer spoke. That manatees are particularly aware of

⁵Prof. R. J. Harrison and Dr. J. D. W. Tomlinson, of the London Hospital Medical College (University of London), in describing the dissection of a 6' 3" specimen from British Guiana, write:

"The external auditory meatus is a very narrow tube that scarcely admits a seeker. It is about 40 mm. in length and at the surface only 2 mm. in diameter. The meatus is a fairly straight tube, narrowing to almost occlusion point where it obliquely meets the tympanic membrane. The inside of the meatus is a pigmented greyish colour and there is no sign whatever of any wax plug. . . . The tube is embedded in semifluid mucoid tissue and as it approaches the tympanic membrane becomes almost undissectable."

⁶All manatees caught by the Fisheries Service were treated orally with sixteen 250 mg. tablets of Griseofulvin as a fungicide.

⁷Vincent Roth, formerly Director of the Georgetown Museum, reports hearing a "long blast of air from its wide nostrils" in his "Notes and Observations on Animal Life in British Guiana," 1941, published by the "Daily Chronicle," Ltd., Georgetown.

⁸Thomas Gann, *Ancient Cities and Modern Tribes*; Duckworth, London, 1926 (pp. 25-29).

human beings is supported by the fact that such actions as stamping, clicking the tongue, starting a motion picture camera or whistling, either naturally or with a variable-pitch dog whistle, evoked no response, whereas the human voice, however soft, was immediately effective and the animals submerged. Perhaps in the muddy waters of British Guiana it is not surprising that ears rather than eyes seem to be used in detecting danger. It is probable that vibrations in the water are also keenly perceived. There is no information about their powers of smell, though their olfactory organs are anatomically well developed. Manatees are believed by some to possess a homing instinct and to be able to find their way back to their original river from considerable distances⁹.

BREEDING

Very little is known about the breeding of manatees in British Guiana. Despite exhaustive enquiries, only three people were found who had seen them mating (twice in the Abary River and once in the Botanic Gardens in Georgetown). On all three occasions the animals were in shallow water. The most detailed account states that at 9 a.m. on January 9, 1955, about thirty-five miles up the Abary River, a school of 14 to 16 manatees was watched for 2½ hours and "they were disporting themselves and gave the impression of fighting. Later they moved into the shallow and worked themselves up the bank into six inches of water. Then they mated lying on their sides." The river was said to be in flood and two feet above the normal level¹⁰.

It may well be that the availability of precise physical circumstances will prove important in attempts to get manatees to breed in semi-domestication.

No information is available about gestation periods, details of birth, suckling habits or rate of growth of this subspecies. Of the Florida subspecies at least one manatee has been born in captivity, and there is evidence that gestation is more than 152 days (Moore, 1951b, pp. 26-29; 1957, pp. 137-138).

Surprisingly, among all the many people questioned in British Guiana, only eight had seen young manatees, though admittedly it is difficult to judge the size of these animals in their natural conditions. These young were reported

from various parts of the country and there seemed to be no proper deduction that one area was better than another for breeding. Among the animals which had been kept in the Botanic Gardens since 1885, at least one birth had taken place, but not in the last twenty years. Evidence here suggests that manatees are long lived, but there are insufficient records to give actual ages. It is certainly evident that they are very slow breeders.

Attempts to rear on a bottle two young ones caught at sizes of 3 ft. 5 in. and about 4 feet were unsuccessful and the animals both died within a month of capture.

BALANCE IN NATURE

In considering the possible future of manatees, it is well to consider the factors, both disadvantageous and advantageous, influencing the survival of the species. In British Guiana and probably everywhere, the main enemy is man. Not only does man kill manatees for meat, but he disturbs them with his guns and propellers. The expanding population brings greater disturbance and the increasing use, in particular, of outboard motors on dugout canoes, is undoubtedly scaring these animals away from many of the lower reaches of the rivers.

Lesser enemies than man are the caiman, which may possibly take a small toll, especially of young animals. Parrot-fish, too, would be likely to devour any injured specimens. Apart from their large size, manatees are defenceless creatures with neither offensive teeth nor claws. Not only are the individuals vulnerable to any attack, but the stock as a whole is easily damaged because of the slowness of their breeding.

Factors favoring survival fortunately also exist. Probably most important of these are the surreptitious habits of the animals themselves. Their acute awareness of danger from human beings and their silent submergence must give them good natural protection. In addition there is legal protection. In British Guiana no manatees may legally be killed except by occasional special permission from the Director of Agriculture. Unfortunately it is always harder to enforce legislation than to make it, and particularly is this so in a country of poor communications and a population short of meat.

Possibly the most important favorable factor is the potential use of manatees as weed clearers. In limited areas, making use of their large appetites and varied tastes, Allsopp has shown them to be extremely efficient at clearing weed-choked channels and in keeping clear the water in pools and waterways (1960, p. 762). So far, none of the manatees thus used has bred under condi-

⁹Mr. David Richardson of Booker Bros. writes that "on two separate occasions, a manatee got out from the channel in which it was penned and was found sixteen miles away, but prevented from getting into the Canje River (from which it had come) by a sluice."

¹⁰This information was communicated to Mr. Arthur Goodland of Booker Bros., who kindly forwarded it.

tions in which they work in weed clearance so that this use at present constitutes a further drain on the stock. However, if this difficulty can be overcome, and manatees can be brought to breed freely in this state of semi-domestication, then there is great scope for expanding this use. Once a species becomes of economic value, its chances of survival increase.

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